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(54) Modular printer system

(57) In an arrangement for printing data derived from a separable (eg hand portable) computing device 30, the device is complementarily engagable with a terminal 14, and both the terminal 14 and a printer 16 are housed within respective compartments of a framework 21.

The assembly of framework 21, printer 16 and terminal 14 may be hand portable (eg by a handle engaged in groove 21c) or may be free standing (Figs 15-16, not shown).

FIG. 2

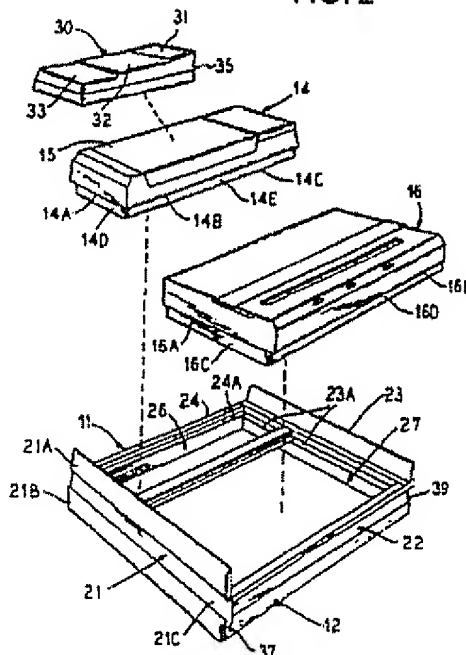


FIG. 1

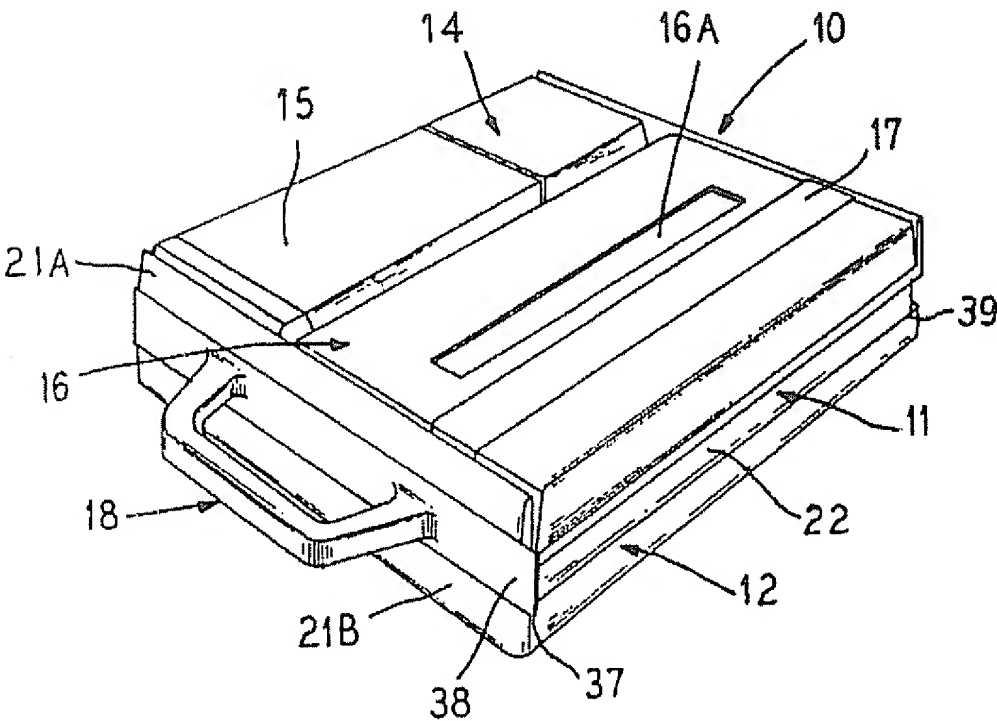


FIG. 5

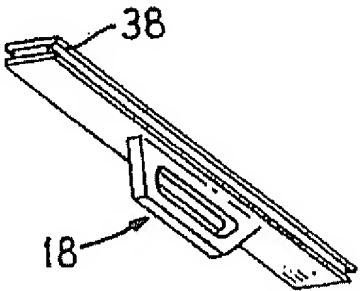


FIG. 2

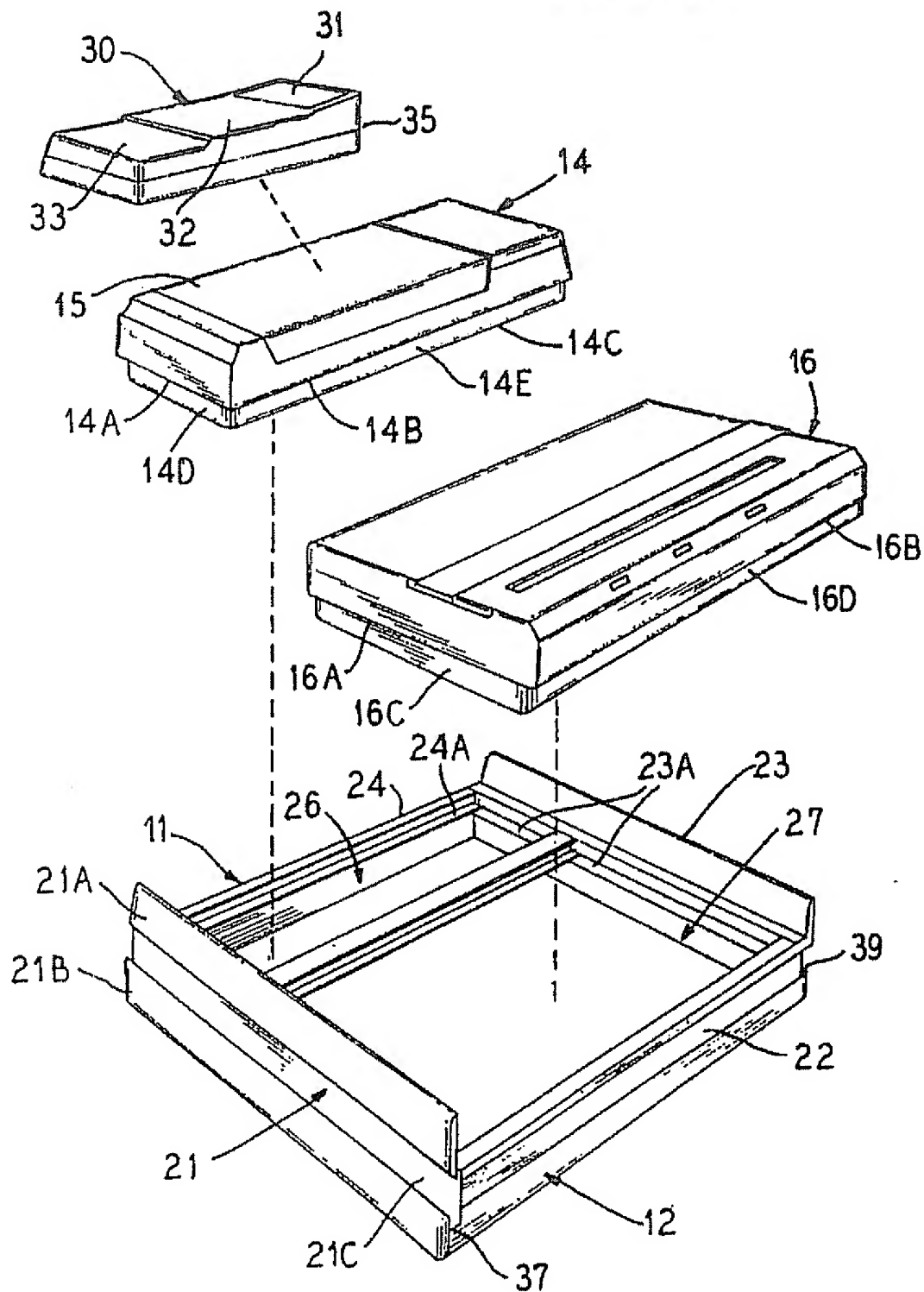


FIG. 3

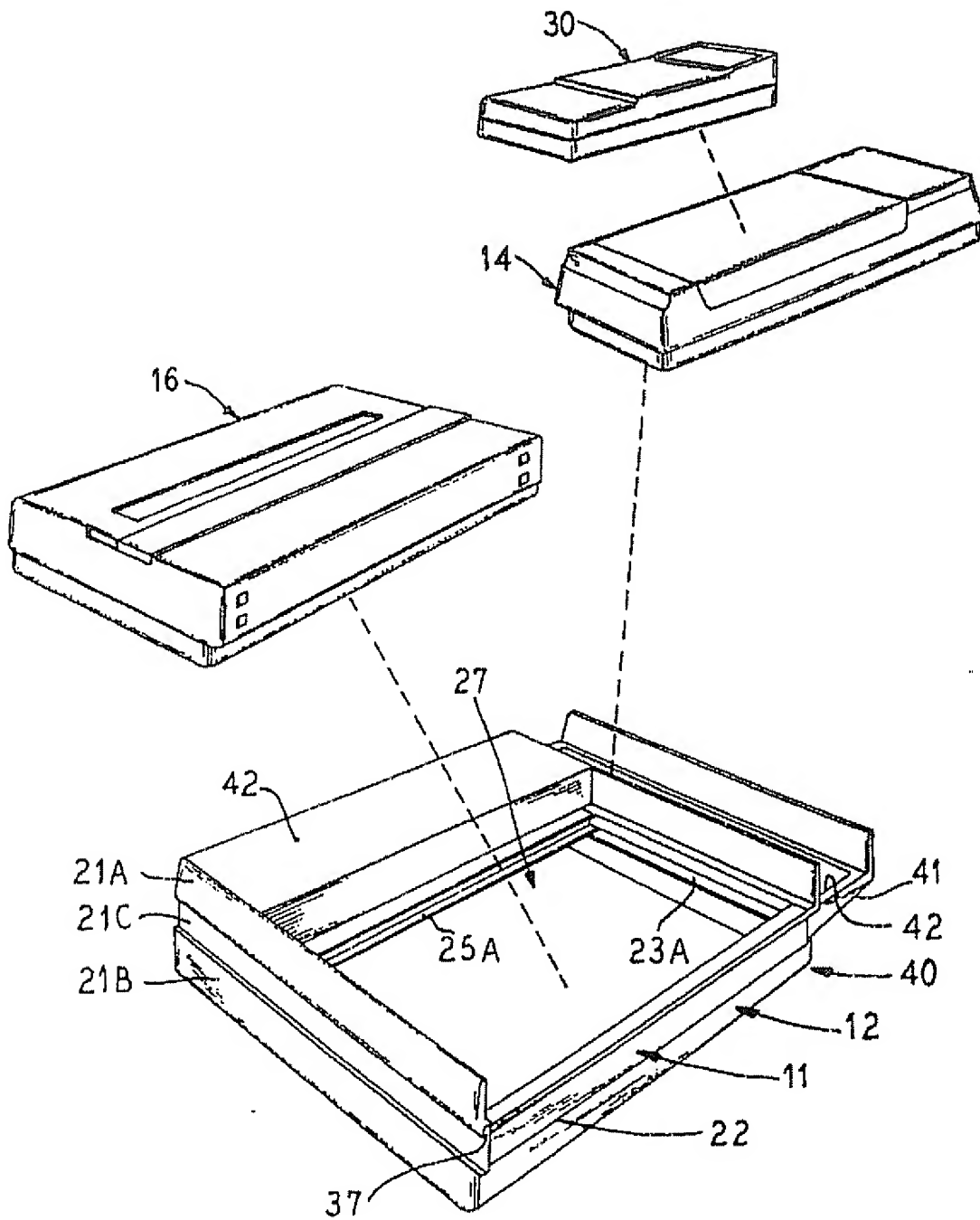


FIG. 4

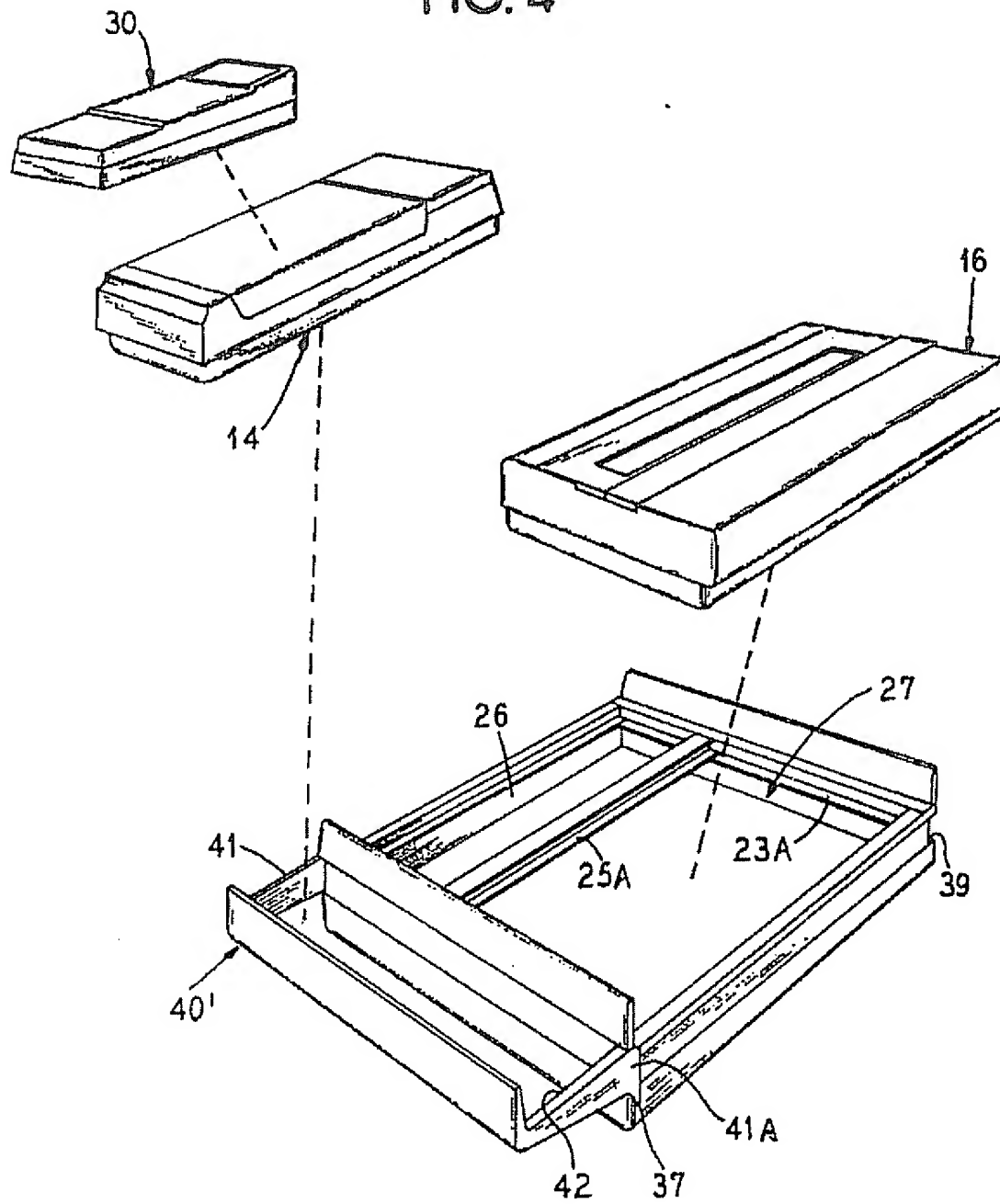


FIG. 6

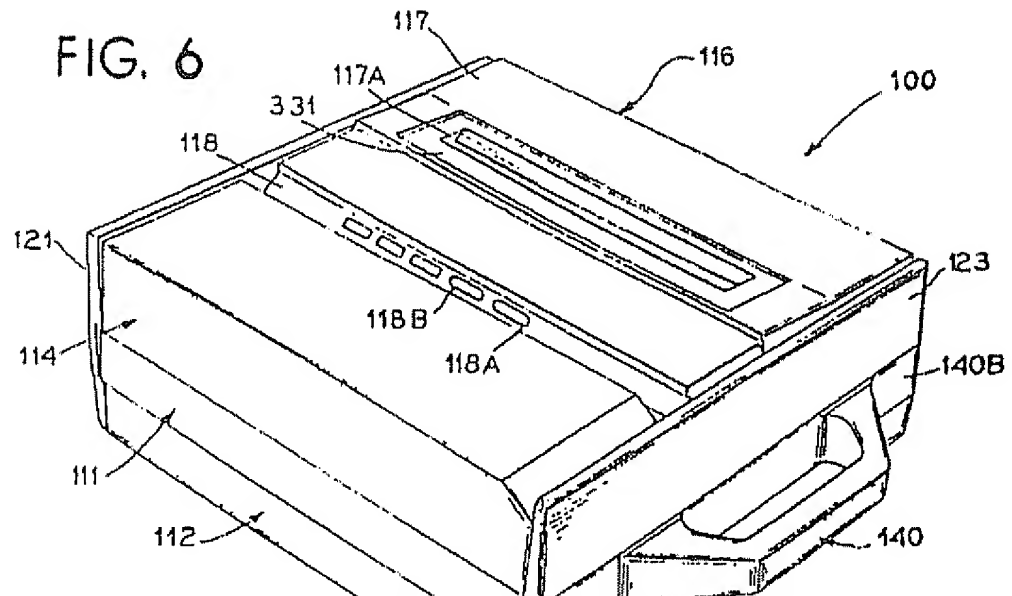


FIG. 7

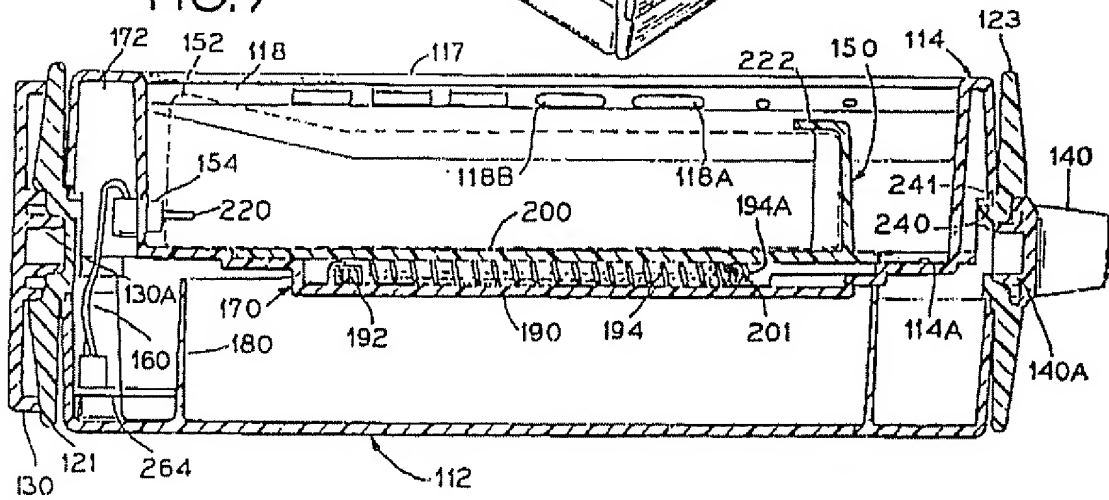
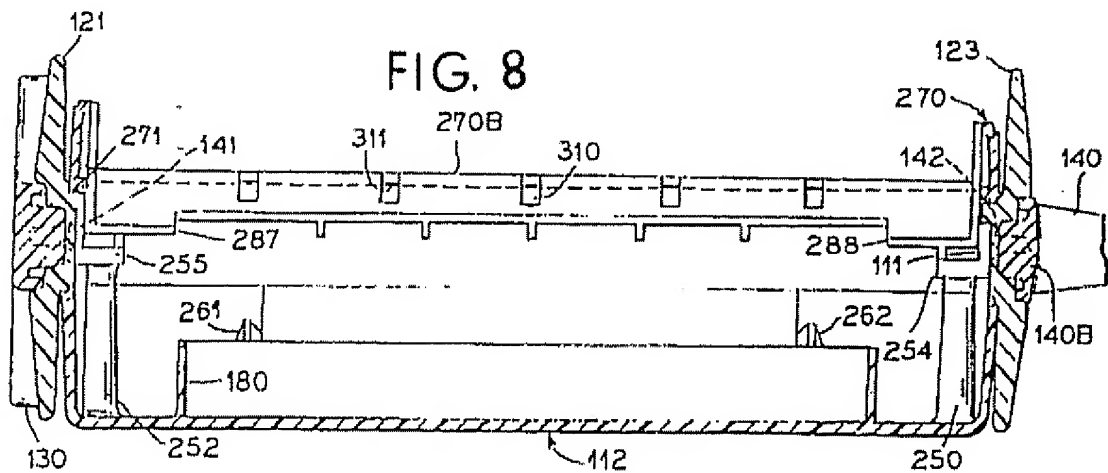


FIG. 8



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FIG. 13

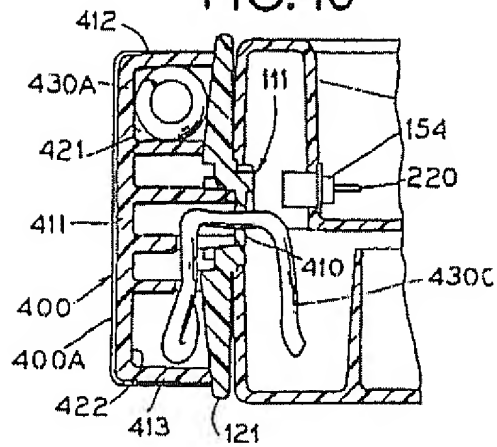


FIG. 14

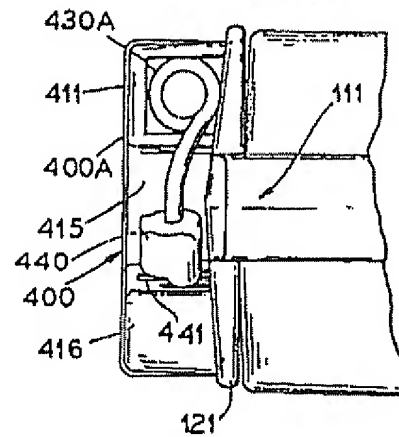


FIG. 12

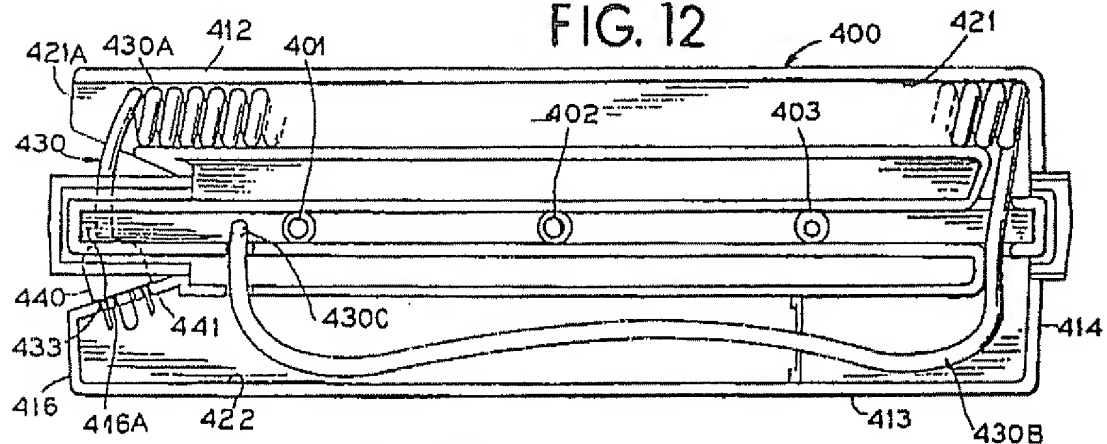
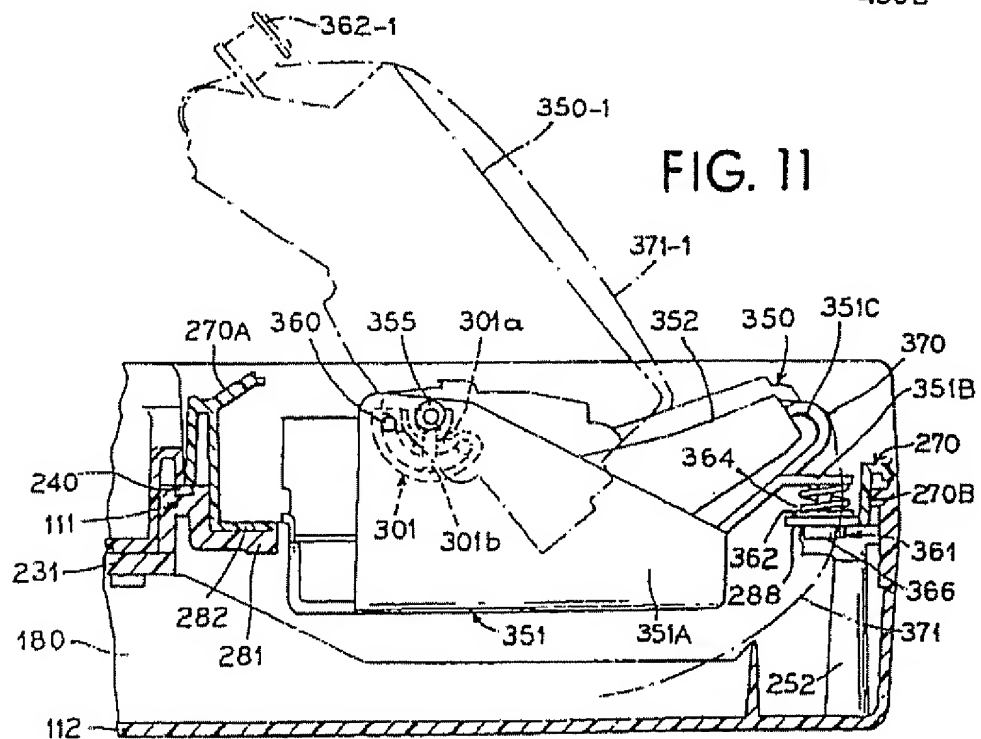


FIG. 11



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MODULAR PRINTER SYSTEM

DESCRIPTION

This invention is particularly concerned with printer devices such as are utilized in connection with product delivery e.g. to retail stores. In a field known as route accounting, a computerized terminal maintains price and quantity information concerning various items to be delivered at a series of stores, and a printer unit is utilized to produce a printed record for each customer. The printer may be carried into each store with the terminal, or the printer may be part of the fixed equipment within a delivery vehicle.

In a typical route accounting system, a portable modular printer device may comprise a briefcase containing the printer unit. Preferably such portable systems have a receptacle for plug-in coupling of a computerized terminal.

In the past, systems providing an eighty column printing capacity have utilized portable configurations representing relatively high cost beyond the cost of the basic printer unit, and adding very substantially to the basic weight of the printer.

It is conceived that it would be highly beneficial to create a portable printer system requiring only minimal additions in terms of cost and weight over that of the basic printer. It would be ideal if a modular standardized construction could be applicable also to non-portable printer systems and capable of readily receiving computerized terminals of different configuration.

Accordingly, it is a basic objective of the invention to provide a portable printer device which adds only minimal cost and weight to a basic printer unit.

A further object is to provide a modular printer device which is of particularly compact and convenient dimensions for portable use and yet which is readily

converted to use in non-portable applications such as are common in the route accounting field.

Another related object is to provide a basic standardized frame construction which is readily adapted to the reception of improved printer units and more compact computerized terminal configurations as such become economically feasible.

A particularly advantageous embodiment of the invention utilizes a standardized open frame construction for receiving a modular printer assembly and a modular terminal assembly. The frame may have an external configuration so as to snugly receive a carrying handle and/or other attachment suitable for a portable device, or to receive an auxiliary terminal mounting bracket facilitating use as a non-portable installation. A paper tray module for the printer unit may itself provide the bottom closure for the standard open frame, and serve with the frame as part of a water repellant encasement for the modular printer assembly. The printer housing module may accommodate one hundred and eighty degree reversal of the printer unit to adapt to portable or vehicle mounting. A low cost printer adapter means may adapt a printer housing module to different printer units, and a light weight economical terminal module may serve to adapt the standard frame to different size terminal configurations of a terminal family.

Other objects, features and advantages will be apparent from the following detailed description taken in conjunction with the accompanying sheets of drawings, and from the respective individual features of the appended claims.

FIG. 1 is a somewhat diagrammatic perspective view showing a modular printer system configured as a unitary portable device and embodying teachings and concepts of the present invention;

FIG. 2 is in the nature of an exploded view wherein a terminal and its receiving terminal module, and a printer module containing a printer unit, are shown offset from their respective receptacles in a standardized open frame which has a paper tray module assembled as a bottom closure therewith;

FIG. 3 is a somewhat diagrammatic exploded-type perspective view similar to FIG. 2, but illustrating the case where the standardized open frame with associated paper tray as bottom closure, is further provided with a cradle serving as an auxiliary receptacle for receiving the modular terminal assembly, and showing the modular printer assembly in a reversed orientation in comparison to FIG. 2;

FIG. 4 is a somewhat diagrammatic exploded-type perspective view similar to FIG. 3, but showing the terminal cradle at an opposite side of the open frame;

FIG. 5 is a somewhat diagrammatic perspective view of the carrying handle showing the handle as it appears when removed from the remaining parts of FIG. 1;

FIG. 6 is a somewhat diagrammatic perspective view of a portable version of the invention as actually constructed;

FIG. 7 is a somewhat diagrammatic transverse sectional view of the embodiment of FIG. 6 and showing internal construction at the terminal module of the portable device;

FIG. 8 is a somewhat diagrammatic transverse sectional view of the embodiment of FIG. 6 and showing the printer case and other internal parts at a rear printer module receiving portion of the portable version of FIGS. 6 and 7, the printer cover, and printer module having been removed from the printer case to reveal the rear wall of the printer case;

FIG. 9 is a somewhat diagrammatic top plan view of the portable version of the invention, with the printer

module, printer cover and instrument panel finish strip removed to show interior construction of the printer case and paper tray module;

FIG. 10 is a somewhat diagrammatic longitudinal sectional view of the portable embodiment of FIG. 6;

FIG. 11 is an enlarged somewhat diagrammatic partial longitudinal sectional view showing the printer module within the printer case, and indicating a pivoted position of the printer module in dot dash outline wherein access is provided to the paper tray bin of the paper tray module;

FIG. 12 is a somewhat diagrammatic side elevational view of an AC adapter module which may replace the foot at the left side of the portable version of FIG. 6 so as to provide for operation of the printer system of FIGS. 6-11 from commercial alternating current power;

FIG. 13 is a somewhat diagrammatic partial transverse sectional view showing the AC adapter module of FIG. 12 operatively secured with the portable embodiment of FIGS. 6-11 in place of the foot member;

FIG. 14 is a somewhat diagrammatic partial elevational view showing the frontal end of the AC adapter module of FIGS. 12 and 13;

FIG. 15 is a somewhat diagrammatic perspective view of a non-portable version of the printer system which utilizes the frame module, and other components of FIGS. 6-11, rearranged so as to be particularly suited to mounting in a delivery vehicle or the like; and

FIG. 16 is a somewhat diagrammatic longitudinal sectional view of the device of FIG. 15, and showing use of a paper tray module of greater capacity than that of FIGS. 6-11.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

In FIG. 1, a unitary modular portable printer device 10 is shown as comprising a standardized open

frame module 11 having a paper tray module 12 assembled therewith as bottom closure.

Fitting within the open frame 11 are a terminal module 14 with a hinged cover 15, and a printer module 16 having a paper outlet slot 16A which may be selectively covered by means of a laterally shiftable cover strip 17.

A carrying handle 18 is slidably engaged with an external side of the open frame 11.

As seen in FIG. 2, the open frame 11 is composed of four rectilinearly arranged frame elements 21-24 and a single additional frame element or crosspiece 25 subdividing the open frame to provide a terminal receptacle 26 and a printer receptacle 27.

As shown in FIG. 2, the terminal module 14 has downward directed horizontal surfaces such as 14A and 14B at the four side thereof which are upwardly offset relative to a bottom 14C of the terminal module. Vertically disposed side walls such as 14D and 14E extend from the outer perimeter of the bottom 14C to inner margins of the surfaces such as 14A and 14B. The terminal module 14 fits into receptacle 26 with surfaces such as 14A and 14B resting on four rectilinearly arranged ledge portions such as 23A and 24A which are provided by the frame elements 21, 23, 24 and 25. These ledge portions at their inner edges confront the terminal module side walls such as 14D and 14E when the terminal module is assembled therewith.

Thus the ledge portions such as 23A, 24A of the frame elements 21, 23, 24 and 25 may be taken as principally defining terminal module receptacle 26.

Similarly ledges such as 23A and 25A of frame elements 21, 22, 23 and 25 support upwardly offset surfaces such as 16A and 16B of printer module 16, and confront side walls such as 16C and 16D, and may be taken as essentially defining printer module receptacle 27.

The terminal module 14 releasably receives the computerized terminal 30 upon opening of cover 15. By way of example the terminal module 14 may have an interior space of size to receive terminals known as the model 121XL and model 141XL of the Norand Corporation, Cedar Rapids, Iowa.

Such terminals 30 have a display region 31, a keyboard region 32 and a battery compartment region 33, and may be used for route accounting operations, for example. The terminal 30 may have an electrical interface at its end 35 which may comprise a 15-pin connector which mates with a mating connector within module 14 as the terminal is inserted into its module. A terminal 30 may weigh about one kilogram including batteries, memory and communications adapter. As with present printers of Norand Corporation, the electrical interface at 35 and other constituents of terminal 30 may allow the supply of data to the terminal module interface for printing by means of the printer unit within printer module 16.

By way of example printer module 16 may be of interior configuration to receive a commercially available eighty column printer which can print on three-ply fanfold paper supplied by the paper tray module 12, e.g. paper having a width between 5.0 inches and 10.0 inches. An example of such a printer is the Citizen MPS-20.

Paper tray module 12 may for example, for the portable device have a capacity of fifty sheets of three-ply paper. As an option for a non-portable device as in FIG. 3, a paper tray module may have a capacity of two hundred three-ply sheets.

FIG. 2 shows the frame element 21 as including upper and lower flange portions 21A and 21B which have opposed edges overhanging a central body portion 21C so as to define a guideway 37 for receiving a slider member 38, FIG. 5, integral with the carrying handle 18. A

similar guideway 39 is defined by flange portions of the frame element 23.

In FIG. 3, the open frame 11 and paper tray 12 may be identical and yet provide a non-portable subassembly 40 which may differ from portable device 10 by the absence of handle 18, and attachment of a side arm bracket 41 to the frame 11. The bracket 41 may form a terminal cradle with a terminal module receptacle 42 receiving a terminal module 14 identical to that received by portable device 10. The printer module receptacle 27 is identical to that of the portable device 10, so as to receive the printer module 16 in the same orientation as in FIG. 1, or reversed as in FIG. 2. A second terminal may be located at 42, FIG. 3, where it may be automatically maintained in a charged condition by means of a charger connected with vehicle power. A lockable lift-up cover of module 14 may retain a terminal 30 similarly to the way shown in a brochure number 960-382-509 of Norand Corporation which has a 1985 copyright notice and which relates to a data system for bakery distribution. The content of this brochure is incorporated herein by reference in its entirety by way of background information as to exemplary functioning of the computerized terminal 30 and of the illustrated printer systems.

FIG. 4 shows a non-portable printer subassembly 40' identical to subassembly 40 except that the side arm bracket 41 is mounted on the left side of the printer module receptacle 27 instead of the right side as in FIG. 3. In FIG. 4, the terminal module receptacle 26 is shown ready to receive a second terminal module so that two terminals such as 30 may be present where desired. For example, one terminal at 26 may be recharged while the second terminal 30 is removed from a terminal module 14 secured in receptacle 42 for use during delivery to a retail store or the like.

As best seen in FIG. 4, the side arm bracket 41 may have a slider member 41A integral therewith which is slidably engageable in guideway 37, FIG. 3, or guideway 39, FIG. 4. Suitable means, not shown, may retain the handle or terminal cradle in assembled relationship to the frame, e.g. screws or the like. Similarly, the terminal and printer modules may be fixedly retained with the open frame e.g. by threaded fasteners.

By way of example, the portable printer device 10 of FIG. 1 may consist essentially of open frame 11 with handle 18, tray module 12 secured to the open frame 11, terminal module 14 secured to the open frame 11, and printer module 16 secured to the open frame 11 and containing a printer unit which can be readily removable from module 16 to provide quick access to the paper tray 12. The terminal module 14 may removably receive a computerized terminal such as 30, FIG. 2, essentially as shown in the incorporated brochure number 960-382-509 of 1985 for the case of a van-mounted printer installation or for the case of a multi-terminal charger installation (except that a manually operated latch may be substituted for a lock on the hinged cover 15).

The terminal module for a given terminal configuration is essentially the same for portable and non-portable devices. The terminal module is field replaceable by the customer through the use of simple tools so that the customer has the option of replacing an original terminal module with one for a new terminal, e.g. a physically smaller terminal.

By way of example, a non-portable printer device may consist essentially of a subassembly 40 or 40' formed of the open frame 11 and paper tray 12, together with a side arm terminal cradle 41 and a printer module 16 secured to the frame 10. Module 16 would again contain a printer unit which is readily removable so as to provide quick access to the paper tray module for the replenishing of the paper supply.

In the portable and non-portable devices, the printer and terminal keyboard are preferably operable without removing or lifting a cover. The overall dimensions of each device, exclusive of parts 18 or 41, may be less than 5 1/2 inches high, 15 1/2 inches wide and 14 1/2 inches deep. The portable device with a self-contained chargeable battery (not shown) for the printer unit may have a weight of less than twelve pounds excluding terminal 30. The battery when fully charged may provide for 10,000 lines of printed output.

A DC/DC battery charger may be an optional source of overnight trickle charging for the printer battery from a route vehicle battery, similarly to the Model NP207 briefcase printer of Norand Corporation.

As in the systems of incorporated brochure 960-382-509 of 1985, the portable and non-portable systems herein provide for data communication from the terminal 30 via the terminal module 14 to the printer unit associated with printer module 16. For example, the printer unit may have a pendant cable for receiving power, data and control signals. The length of the printer cable may be sufficient to plug into a receptacle of the printer module prior to assembly of the printer unit with the printer module.

The portable unit may have an AC/DC battery charger operable from commercial alternating current power for charging the batteries of a terminal 30 which is inserted into the terminal module 14 and for charging the printer battery. By way of example, the battery charger may be located in extra space within the paper tray 12 along with the printer battery. An adjacent electric power receptacle may releasably receive an alternating current power cord for supplying commercial alternating current power to the charger during battery charging operation.

Rain covers may be provided for the portable device and may be snapped on over the terminal module 14 and the

printer module 16. Alternatively strips of synthetic materials which adhere when pressed together, and known under the trademark VELCRO, may be applied to mating edges of the open frame 11 and of a top cover therefor.

To facilitate van mounting of the non-portable device, the printer module 16 may be assembled in receptacle 27 in a first orientation with the front of the printer adjacent frame element 22 as shown in FIG. 2, or in a second reverse orientation with the rear of the printer adjacent frame element 22 as shown in FIG. 3. The terminal cradle 40 may be secured at either of two opposite sides of open frame 11 as shown in FIGS. 3 and 4.

Data communication between the terminal module 14 and the printer module 16 or preferably the printer unit therein may take place via optical couplers and fiber optic conduits molded into the open frame 11. Optical couplers may be provided at frame elements 25 and 22, FIG. 2, to accommodate a single optical coupler of the printer unit, or the printer unit may be provided with two optical couplers in parallel each registering with a single optical coupling on the frame 11 for a respective one of two different orientations of the printer module and printer.

A van mounting plate (not shown) may be provided with tilt adjustment so that the angle of the modular printer device may be optimized in a non-portable installation.

As in the system of brochure number 960-382-509 of 1985, operating power for the charging of the terminal and printer batteries may be obtained from the vehicle power system in which the modular printer device is installed.

DESCRIPTION OF FIGS. 6-16

FIG. 6 is a perspective view illustrating a commercial version of a portable modular printer device 100 in accordance with the present invention. As in the previous embodiment, the device comprises a standardized open frame module 111 which receives a paper tray module 112, a terminal module 114 and a printer module 116. In this embodiment a printer cover 117 has a paper outlet slot 117A. A control panel 118 may include actuating regions such as "Advance Page" actuator 118A and a "Set Top of Page" actuator 118B.

The open frame 111 may have a configuration similar to that of frame 11 of FIG. 2, and in each embodiment the frame may be of integral unitary construction and of structural plastic material (e.g. Noryl FN-215) so as to provide the desired strength and rigidity with a minimum weight of material. Left and right frame elements 121 and 123 have upper and lower flange portions similar to flanges 21A, 21B, FIG. 2, which protectively embrace terminal module 114, printer module 116 and paper tray module 112.

As best seen in FIG. 7, frame elements 121 and 123 have central grooves which are shown as receiving an interior rib structure 130A of a foot member 130 and a base rib structure 140A of a handle member 140. Threaded fastening elements such as indicated at 141 and 142 in FIG. 8 may secure members 130 and 140 with the frame 111. As seen FIG. 6, a base 140B of handle member 140 may extend for the entire length of frame element 123 so as to completely cover the central groove therein.

As shown in FIG. 7, terminal module 114 has an elongated recess 114A accommodating reciprocal movement of a terminal retainer bracket 150. A hand-held terminal corresponding to terminal 30, FIG. 2, is indicated in dash outline at 152, FIG. 7, in coupled relationship to the terminal module 114. The terminal 152 is disengaged

from the terminal module by sliding the retainer bracket 150 to the right as seen in FIG. 7, against the action of a spring means located in a bottom portion of the terminal module 114. The spring means acts on the bracket 150 with sufficient force to insure inter-engagement of a socket of the terminal 152 with a plug type connector 154 associated with the terminal module 114. Connector 154 is connected with the electric circuitry of the printer device 100 by means of a cable indicated at 160. As previously described, connector 154 and cable 160 provide for data communication between the terminal indicated at 152 and a printer unit associated with printer module 116.

As seen in FIG. 7, terminal module 114 is comprised of a terminal holder base 170 of molded plastic construction (e.g. Cycolac KJW, Borg Warner). The base 170 may be threadedly secured to bosses integral with the underlying frame elements corresponding elements 24 and 25, FIG. 2. The base 170 is provided with a double wall configuration at its opposite longitudinal ends such that the cable 160 may extend within an enclosed chamber 172.

As shown in FIG. 8, paper tray module 112 of the portable device 100 may be provided with a fifty sheet paper bin 180 for holding a supply of paper which is to be automatically fed into the printer mechanism. The paper tray 112-1 shown in FIG. 16 is equipped with a larger paper bin 180-1 capable of holding 200 sheets for automatic feed into a printer mechanism. The larger capacity paper tray module 112-1 is normally associated with a non-portable device such as shown in FIGS. 15 and 16. The paper tray modules 112 and 112-1 may be identical except for the difference in capacity of the paper bins.

As diagrammatically indicated in FIGS. 7, 9 and 10, terminal holder base 170 may have an integral depressed central bottom 190 (FIG. 7) with two integral upstanding

bosses 191, 192 (FIG. 9) serving to secure the ends of a tension spring indicated diagrammatically at 194. The bracket 150 includes an integral slider piece 200 with an integral depending lug 201 about which a mid region 194A of spring 194 may extend.

As best seen in FIG. 10, slider piece 200 may have integral depending legs with outturned feet such as 211 which interengage with ledge parts such as 215 which are integral with the terminal holder base 170. The upper edges of the ledge parts such as 215 are chamfered, e.g. over a distance of .040 inch at forty-five degrees, at their inner edges so that the feet such as 211 will be cammed inwardly as the sliding retainer bracket 150 is pressed downwardly during assembly with the terminal holder base 170. The legs 211 snap into interengagement with ledges such as 215 to hold the parts in assembled relation while accommodating longitudinal sliding motion of the retainer bracket 150.

As seen in FIGS. 7, 9 and 10, the connector 154 has an associated alignment pin 220 which engages in a receiving socket on the terminal 152 and assures reliable interengagement of the connector pins and sockets in spite of manufacturing tolerances. The depressed bottom 190 of the terminal holder base provides a clearance space 221, FIG. 9, into which the slider piece 200 moves to accommodate insertion of one end of the computer terminal 152, FIG. 7, under lip 222 of the retainer bracket 150, and to allow the opposite end of the terminal 152 to be lowered into engageable alignment with the pin 220, after which the bracket 150 is allowed to move to the left (as viewed in FIG. 7) until the terminal 152 is interengaged with connector 154 in readiness for a data transfer operation.

In an embodiment actually constructed, the ledges such as 215 had a length of about 5.4 inches, and the outturned feet such as 211 had a length of about four

inches. The length of the slider piece 200 was about 9.1 inches while its slideway including clearance space 221 was about 10.2 inches, the slider piece 200 being longitudinally shiftable over a distance of about one inch against the action of spring 194.

To fasten the terminal module 114 with the open frame 111, the open frame is provided with four integral tabs such as 231, FIG. 10, having internally threaded sleeves for receiving screws such as 232, FIGS. 9 and 10.

As can be seen in FIGS. 7 and 10, a sealing strip 240 extends about the perimeter of the two openings in the frame 111 with a downturned integral edge 241 of the terminal module 114 being held in sealing relation against the seal strip 240 continuously about the perimeter of the terminal module.

Referring to FIGS. 8 and 10, the paper tray module 180 has bosses such as 250 (FIG. 8), 251 (FIG. 10) and 252 (FIGS. 8 and 10) at respective corners which receiver screws such as 253, FIG. 10, threadedly engaged with the frame 111. In particular, the frame has integral corner tabs such as 254 (FIG. 8), 255 (FIGS. 8 and 10) and 256 (FIG. 10) with internally threaded sleeves for receiving the screws such as 253.

As seen in FIG. 9, the paper tray module includes a pair of integral retaining fingers 261, 262 for receiving a battery pack 263 for use during portable operation. A printed circuit board 264, FIG. 7, occupying a left marginal region of the paper tray 112 may have a plug-in type receptacle thereon adjacent finger 261, FIG. 9, for receiving input direct current operating power from the battery pack.

In the illustrated embodiment the control panel 118 includes an apertured structural member 270A which is an integral part of a one-piece printer case 270 of plastic material (e.g. Cycolac KJW, Borg Warner). The case is of generally open rectangular configuration and overlies

four elements of the frame 111 (corresponding to frame elements 21, 22, 23, 25, FIG. 2). The case 270 includes a rectangular perimeter 271, FIG. 10, which continuously sealingly engages the sealing strip 240.

The frame 111 includes an integral crosspiece 280, FIG. 10, with integral tab portions such as 281, FIG. 10, having threaded sleeves to which overlying flanges such as 282 (FIGS. 9 and 10) and 283 (FIG. 9) of the printer case 270 are secured by means of screws such as 284. Corner tabs 254 and 255, FIG. 8, of the frame 111 are threadably engaged with corner flange parts 287 (FIGS. 8-10) and 288 (FIG. 8 and 9) as indicated by screw 291, FIGS. 9 and 10.

The printer case 270 is provided with integral inwardly projecting ribs at opposite sides thereof which define printer module mounting means 301, 302, FIGS. 9 and 10. The purpose of mounting means 301, 302 is explained in detail hereafter in reference to FIG. 11. As seen in FIG. 10, each of the mounting means includes a vertical guide channel such as 301A connecting with an arcuate guide channel such as 301B.

As seen in FIG. 8, a rear wall element 270B of the printer case 270 has a series of five notches leaving exposed ledges such as 311 which interengage with hook parts integral with vertical ribs such as 312, FIG. 10. This provides for a hinged coupling of the rear wall 117B of cover 117 with the rear wall 270B of the printer case, the frontal edge of cover 117 having a series of cam hooks such as 314 which can be snapped into engagement with an edge 315 of the printer case 270. When the cover 117 is opened, it can be completely removed by pulling the integral hooks of ribs 312 forwardly out of the notches 310.

The rear wall element 270B, FIG. 10, has a sealing strip 320 secured thereon which engages with a lower edge of cover wall 117B when the cover 117 is in closed

position. The cover 117 has a further sealing strip 321 which together with sealing strip 320 extends along the entire closure perimeter of the cover 117. A clear soft plastic strip 330 may be secured in a recess 331, FIG. 6, e.g. by means of adhesive at 332, FIG. 10, so that a flap 330A of strip 330 normally covers the paper outlet slot 117A while still allowing paper to be fed therefrom during printing operation.

FIG. 11 shows a printer module 350 interengaged with the printer case 270. In particular the printer module is provided with a generally U-shaped pivot frame 351 of pressed metal which adapts various commercially available printer mechanisms such as 352 to the printer case 270.

The pivot frame 351 has upstanding lateral flanges such as 351A each of which carries a pivot shaft with a disk 355 which fits into a conforming receiving slot such as indicated at 356, FIG. 10, of the printer module mounting means 301, 302, FIG. 9. A limit pin 360, FIG. 11, of each pivot frame lateral flange is of lesser diameter than disk 355 so as to be freely movable in the vertical channel 301A and in the arcuate channel 301B, FIG. 10.

The pivot frame 351 of the printer module 350 is further provided with a pair of longitudinally extending flanges such as 351B which carry rotary latch mechanisms 361. The latch mechanisms each include a sleeve 362 which has an extended position as indicated in dot dash outline at 362-1 and which is shiftable against the action of a compression spring 364 as the printer module pivots clockwise as shown in FIG. 11 from the inactive position 350-1 to the position shown in solid lines at 350. As the sleeve 362 retracts a bar-shaped lug 366 moves through a conforming elongated slot such as 367 in a tab such as 288, FIG. 9. When lug 366 reaches a position below the tab 288, a camming action between

sleeve 362 and the lug stem may cause the lug 366 to rotate slightly and interlock with the tab. To release the lug 366, the printer module is rocked slightly in the clockwise direction against the action of spring 364, whereupon the lug 366 is realigned with its slot 367 to allow counterclockwise pivotal movement of the printer module to position 350-1.

The pivot frame 350 further includes a central curved extension 351C disposed between the longitudinal flanges 351B and providing a smooth paper guide face 370 which forms part of a paper feed path 371. When the printer module is pivoted to position 350-1, the paper path may be extended as indicated at 371-1.

FIGS. 12-14 show an AC adapter module 400 which is readily applied to the portable version of FIGS. 6-11 in place of foot member 130. For this purpose, the module 400 is provided with internally threaded sleeves at 401-403 so as to be aligned with respective apertures such as that receiving screw 141, FIG. 8. The frame module of FIGS. 13 and 14 may be identical to the frame module 111 of FIGS. 6-11 so that the same reference numeral has been applied in FIGS. 13 and 14, the aperture 410, FIG. 13, being covered by the foot member 130 in FIGS. 6-11.

The adapter module 400 may have a pair of flat raised parts such as 400A, FIG. 13, for resting stably on a flat surface with the handle uppermost. The module 400 has external closure walls 411-416 and butts against frame element 121 so as to provide a first chamber 421 open only at an end 421A, and a second chamber 422 closed at both ends by walls 414 and 416.

A power cord 430 includes a coiled section 430A stored in chamber 421 and further section 430B extending in chamber 422. An inner end portion 430C of the power cord extends from chamber 422 to a central chamber 433 and then through aperture 410, FIG. 13, in frame 111 and into the interior of the portable device. The AC power

may be supplied to a suitable power supply circuit within the portable device. Alternatively the power supply circuit may be located within chamber 422, for example.

As shown in FIGS. 12 and 14, a conventional power plug 440 is affixed at the outer end of the power cord and when not in use may be engaged in slots 441 in a closure wall 416A at the adjacent end of chamber 422.

When the power cord 430 is to be connected with commercial AC power, the plug 440 is disengaged from the slots 441 in wall 416A, and the coiled section 430A withdrawn as far as necessary from chamber 421 through the open end 421A.

FIGS. 15 and 16 show a non-portable version 500 which may be constructed primarily from the same components as the portable version of FIGS. 6-11. In FIGS. 15 and 16, the frame module 111 may be identical to frame module 111 of FIGS. 6-14 and receive the same reference numerals. In FIGS. 15 and 16, the printer case is identical to the case 270 of FIGS. 6-11 and has the same reference numeral applied thereto. Since the printer case 270, FIG. 16 has been reversed in its receiving space of frame 111, the frame side walls 121 and 123 are to the right and left relative to the control panel 118 which is considered to be at the front of the device.

In FIG. 15, printer cover 117 and paper outlet slot 117A are identical, but are of reversed orientation along with the printer module and printer case 270.

In FIGS. 15 and 16, the receptacle for the terminal module 114 simply receives a cover plate 510, while in place of foot member 130, FIG. 7, the frame module 111 receives a terminal side bracket 520, which secures to the frame in the same manner as foot member 130, FIG. 8, or AC module 400, FIG. 12. The terminal side bracket 520 receives a terminal module 114 identical to that of FIG. 7. Reference numerals 150, 152 and 222 are applied in

FIG. 15 and have been explained in relation to FIGS. 7 and 9.

The aperture 410, FIG. 13, in the frame module 111 is of a size and location to accommodate the cable 160, FIG. 7, for the case of the embodiment of FIGS. 15 and 16.

The paper tray module of FIGS. 15 and 16 may correspond with the paper tray module 112 of FIGS. 7 and 8, but may be of substantially greater depth so that paper bin 180-1 of FIG. 16 may accommodate a substantially greater number of paper sheets, e.g. two hundred paper sheets instead of fifty.

In each of the embodiments of FIGS. 6-11 and 15 and 16, the printer module 350, FIG. 11, may be completely removed from the unit by vertically aligning limit pin 360 under disk 355, FIG. 11, and then lifting module 350 vertically so that pin 360 travels upwardly along channel 301a as the disk is lifted from its receiving recess 356, FIGS. 9 and 10. The electrical connections may be of the pin and socket type so as to readily severed, and readily reestablished.

It will be apparent that many modifications and variations may be made without departing from the scope of the teachings and concepts of the present invention.

CLAIMS

1. In a modular printer system, a unitary modular printer device for containing a computerized terminal for supplying data to be printed and a printer means for printing data supplied by a computerized terminal, said unitary modular printer device comprising an open frame having first terminal module receptacle means and having second printer module receptacle means, a terminal module for releasably receiving a computerized terminal, said terminal module with a received computerized terminal being supported in said first terminal module receptacle means such that data may be supplied from a received computerized terminal to a printer means contained by said unitary modular printer device, and being supported in said second printer module receptacle means, and a printer module for receiving a printer means such that data may be supplied to a received printer means from a computerized terminal in said terminal module.

2. In a modular printer system according to claim 1, a computerized terminal having a first orientation relative to said open frame when mounted in said terminal module, and said open frame having auxiliary means for mounting a computerized terminal so as to extend at a ninety degree angle relative to said first orientation.

3. In a modular printer system according to claim 2, said open frame having an exterior side exteriorly of the open frame, and having reception means for reception of said auxiliary means such that the auxiliary means is readily added at said exterior side of said open frame.

4. In a modular printer system according to claim 1, said first terminal module receptacle means being of configuration adapted to selectively receive one of a plurality of terminal modules of respective different terminal receiving configurations such that the open frame is readily adapted to receive a plurality of computerized terminals of respective different configurations.

5. In a modular printer system according to claim 1, said open frame having an exterior side exteriorly of the open frame, and having reception means for [sliding] reception of a carrying handle to provide for carrying of said unitary modular printer device with one hand.

6. In a modular printer system according to claim 5, a carrying handle engaged in said reception means for one-handed transport of the unitary print-out device.

7. In a modular printer system according to claim 1, a printer unit in said printer module having a paper feed direction, and the printer unit being reversible with the printer module so as to provide a first paper feed direction in the first orientation of the printer module and so as to provide an opposite paper feed direction opposite to said first paper feed direction in the reverse orientation of the printer module.

8. In a modular printer system according to claim 7, said data transmission conduit means comprising a fixed connector means on said terminal module for quick release coupling with a computerized terminal and comprising cable means with a cable end connector coupled with said fixed connector means via said cable means, and said open frame accommodating coupling of the cable end connector of the cable means with the printer unit in each of said first orientation and of said reverse orientation of said printer module.

9. In a modular printer system according to claim 1, 2, 3 or 4, said unitary modular printer device having mounting means accommodating fixed mounting of said device in a mobile vehicle.

10. In a modular printer system according to claim 9, said mounting means comprising a mounting plate and pivot means coupling the mounting plate with the modular printer device to accommodate tilting of the modular printer device relative to said mounting plate.

11. In a modular printer system according to claim 9, said unitary modular printer device consisting essentially of said open frame, said terminal module, and said printer module with a printer unit therein, and a paper tray located beneath the printer unit and providing a bottom closure for the open frame.

12. In a modular printer system according to claim 1, 5, 7 or 8, said unitary modular printer device being readily carried by one hand and consisting essentially of said open frame, said terminal module, said printer module with a printer unit therein, a paper tray secured with the open frame to provide a bottom closure therefor, and a carrying handle secured with the open frame for one-handed transport of the device.

13. In a modular printer system according to claim 1, said open frame consisting essentially of four frame elements arranged in an open rectangular configuration and a single additional cross piece frame element subdividing the open frame, the terminal module having rectilinear margins supported by the open frame at one side of the cross piece frame element and the printer module having rectilinear margins supported by the open frame at the other side of the cross piece frame element.

14. In a modular printer system according to claim 13, a rectilinear paper tray for containing a paper supply for feed to a printer unit in the printer module, said paper tray mating with the open frame to provide a bottom closure therefor.

15. In a modular printer system according to claim 14, said printer unit being pivotal to expose said paper tray for replenishing the paper supply therein.

16. In a modular printer system according to claim 1, said terminal module having an upwardly offset margin resting on the open frame and downwardly extending side walls extending downwardly from the upwardly offset margin and disposed in close confronting relation to the

open frame, the portions of the open frame underlying the upwardly offset margin of the terminal module and the portions of the open frame confronting the side walls of the terminal module comprising said first terminal module receptacle means of the open frame.

17. In a modular printer system according to claim 1, said printer module having an upwardly offset margin resting on the open frame and downwardly extending side walls extending downwardly from the upwardly offset margin and disposed in close confronting relation to the open frame, the portions of the open frame underlying the upwardly offset margin of the printer module and the portions of the open frame confronting the side walls of the printer module comprising said second printer module receptacle means of the open frame.

18. In a modular printer system according to claim 1, data transmission conduit means comprising first optical coupler means for optical coupling with a computerized terminal in the terminal module and comprising second optical coupler means for optical coupling with a printer unit in the printer module both in the first orientation of the printer module and in the reverse orientation of the printer module, and fiber optic transmission conduit means connecting with the optical coupler means for conveying data from a computerized terminal in the terminal module to a printer unit in the printer module via the first and second optical coupler means irrespective of whether the printer module has its first orientation or its reverse orientation.

19. In a modular printer system according to claim 1, an alternating current module connected with the open frame, and containing an alternating current power cord for coupling with an alternating current power outlet, and said unitary modular printer device having means for supplying power to a printer unit received by the printer

module selectively from a portable battery source and from the alternating current power cord.

20. In a modular printer system according to claim 19, said alternating current module having means for releasably storing the alternating current power cord.

21. In a modular printer system according to claim 20, said alternating current module having a wall disposed in spaced relation to an exterior side of the open frame to define a recess in which the power cord is coiled.

22. In a modular printer system according to claim 21, said alternating power cord having a free end with a plug connector thereon, and said alternating current module providing friction retention means for retaining the plug connector therewith to prevent inadvertent displacement of the power cord from the recess.

23. In a modular printer system according to claim 1, said open frame being selectively usable in a fixed installation within a mobile vehicle and in a portable installation for one-handed transport.

24. In a modular printer system according to claim 23, a paper tray disposed below the printer module and mating with the open frame to provide a bottom closure therefor.

25. In a modular printer system according to claim 24, said paper tray having battery receptacle means for supplying operating power to a printer unit in said printer module.

26. In a modular printer system according to claim 1, the terminal module having a spring urged retainer for retaining a hand-held type of computerized terminal therewith.

27. In a modular printer system, a unitary modular printer device having a printer unit capable of eighty column printing on paper automatically fed thereto from a supply of paper, said unitary modular

printer device comprising an open frame having a printer receiving means receiving said printer unit, and a paper tray module providing a paper bin of size to accommodate a substantial supply of paper for automatic feed to said printer unit as received by said printer receiving means, said paper tray module providing a bottom closure for said open frame.

28. In a modular printer system according to claim 27, said unitary modular printer device having a terminal receiving means for accommodating different size hand-held type computerized terminals for automatic coupling to provide data communication with said printer unit as received by said printer receiving means.

29. In a modular printer system according to claim 27 or 28, said unitary modular printer device having a terminal module secured therewith for releasably receiving a hand-held type of computerized terminal and constructed to mechanically guide a hand-held type computerized terminal into a received position where it is automatically coupled for data communication with said printer unit as received by said printer receiving means.

30. In a modular printer system according to claim 27, 28 or 29, said unitary modular printer device having a carrying handle secured to one side of said open frame for convenient transport thereof with one hand.

31. In a modular printer system according to any of claims 27 to 30, said printer receiving means comprising a printer module adapting said printer unit to the unitary modular printer device and accommodating displacement of the printer unit from its operating position so as to provide access to the paper bin for replenishment of the paper supply.

32. In a modular printer system according to any of claims 27 to 31, said open frame having a first section receiving a hand-held type of computerized terminal and a second section receiving said printer

unit, and a covering enclosure covering only the printer unit, such that a hand-held type computerized terminal can be inserted into and removed from the first section without disturbing the covering enclosure for the printer unit.

33. In a modular printer system according to claim 32, said covering enclosure being sealed with the open frame such that the paper bin is protected from moisture during transport of the unitary modular printer device.

34. In a modular printer system according to claim 32 or 33, a terminal module for receiving a hand-held type of computerized terminal, and being sealed with the open frame to protect the paper bin from moisture during transport of the unitary modular printer device.

35. In a modular printer system according to any of claims 27 to 34, said printer receiving means mounting said printer unit selectively in a first orientation and in a reverse orientation rotated one hundred and eighty degrees relative to said first orientation.

36. In a modular printer system according to any of claims 27 to 35, said open frame having terminal receiving means therein adjacent the printer receiving means and constructed to mechanically guide a hand-held type of computerized terminal into a received position where it is automatically coupled for data communication with said printer unit as received by said printer receiving means.

37. In a modular printer system according to any of claims 27 to 36, said printer unit being mechanically guided so as to be displaceable to a paper loading position to expose the paper bin for replenishment of the paper supply therein.

38. In a modular printer system according to claim 37, said printer unit being pivotally movable to an overcenter paper loading position where it is held by gravity until manually returned to its operating position.

39. In a modular printer system according to claim 37 or 38, said printer unit being automatically latched in its operating position as it is returned thereto from the paper loading position.

40. In a modular printer system according to claim 39, said printer unit being unlatched in response to . limited movement from the operating position in a direction away from the paper loading position.

41. In a modular printer system according to claim 38, 39 or 40, said printer unit being completely removable from the printer receiving means when in a position intermediate the operating position and the overcenter paper loading position.

42. In a modular printer system according to any of claims 27 to 41, first optical coupler means for optical coupling with a hand-held type of computerized terminal in a terminal receiving means of the open frame, and second optical coupler means for optical coupling with a printer unit in the printer receiving means, and fiber optic transmission conduit means connecting with the optical coupler means for conveying data from a hand-held type computerized terminal in the terminal receiving means to a printer unit in the printer receiving means via the first and second optical coupler means,

43. In a modular printer system according to any of claims 27 to 42, alternating current connection means for coupling with an alternating current power outlet, and said unitary modular printer device having means for supplying power to the printer unit received by the printer receiving means selectively from a portable battery source and from the alternating current connection means.

44. In a modular printer system according to claim 43, said unitary modular printer device having means for releasably storing an alternating current power cord forming said alternating current connection means.

45. In a modular printer system according to claim 44, a wall disposed in spaced relation to an exterior side of the open frame to define a recess in which the power cord is coiled.

46. In a modular printer system according to claim 44 or 45, said alternating power cord having a free end with a plug connector thereon, and said unitary modular printer device providing friction retention means for retaining the plug connector therewith to prevent inadvertent displacement of the power cord from its stored position.

47. In a modular printer system according to any of claims 27 to 46, said open frame being selectively usable in a fixed installation within a mobile vehicle and in a portable installation for one-handed transport.

48. In a modular printer system according to any of claims 27 to 47, said paper tray module having power supply means therein for supplying operating power to the printer unit.